REMARKS

With the entry of the present amendments, Claims 38-42 and 44-54 are pending in the application. Claims 38, 42 and 44-50 have been amended. Claims 1-37 and 43 have been canceled. New Claims 51-54 have been added. Support for the claim amendments and new claims may be found throughout the application as filed, including but not limited to, paragraph 56.

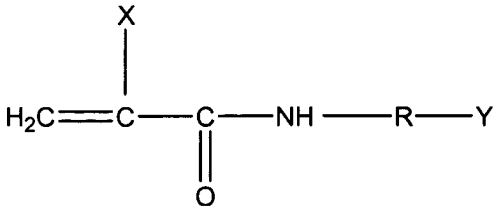
In view of the following remarks, reconsideration and withdrawal of the rejections to the application in the Office Action is respectfully requested.

I. Rejection of Claims Under 35 U.S.C. § 102(b)

Claim 38 was rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 4,568,706, issued to Noetzel (hereinafter "Noetzel"). In view of the present amendments to Claim 38, Applicants respectfully traverse.

In order to establish a *prima facie* case of anticipation, a cited reference must teach each and every limitation of the rejected claims. (MPEP 2131)

Noetzel does not teach each and every limitation of amended Claim 38. As amended Claim 38 recites a polymer surface wherein the polymer is selected from the group consisting of polycarbonate, polymethyl methacrylate, polystyrene, acetal, polyethylene, polypropylene, polyester terephthalate, and polytetrafluoroethylene. Noetzel discloses a polymeric material that may be used as a carrier material for biologically active substances. (See col. 1, lines 40-45.) All of the polymeric materials recited in Noetzel are derived from monomers having the following formula:



wherein X is hydrogen or methyl, R denotes an aliphatic hydrocarbon radical having 1 to 12 carbon atoms and Y represents OH or NH_2. This is discussed at length throughout Noetzel including, but not limited to, col. 1, lines 48-65. None of the polymers recited in amended Claim 38 are derived from monomers having the formula shown above. Therefore, Noetzel fails to teach each and every limitation of Claim 38 as amended and Applicants respectfully request that this rejection be withdrawn.

Applicants further note that the substitution of the polymers recited in amended Claim 38 for the polymeric material of Noetzel would not be obvious in view of the cited prior art. In order to establish a *prima facie* case of obviousness, three criteria must met: (1) the recited references must provide some motivation to modify the references teachings; (2) there must be a reasonable expectation of success; and (3) the resulting combination must teach or suggest all of the limitations of the rejected claims. (MPEP 2142) Noetzel provides no suggestion or motivation to replace the specific polymeric materials disclosed therein with the polymers recited in amended Claim 38. This true of all the polymers recited in amended Claims 38, but is particularly true of those polymers that are also recited in new Claim 52, which are conventionally considered to be inert to wet chemical reactions. Therefore, Claim 38 is patentable over Noetzel.

II. Rejection of Claims under 35 U.S.C. § 103(a) over Noetzel in View of Yang

Claims 39-50 were rejected under 35 U.S.C. § 103(a) as unpatentable over Noetzel in view of the Yang article. In support of this rejection, the Examiner stated:

> The Yang article suggests the use of diamond-like as the substrate for a biomolecular carrier. ...Yang states that diamond-like material 'is unique in its ability to achieve very high stability and sensitivity while also being compatible with microelectronics processing technologies' (Yang, p. 253, left column). Because of the superiority of diamond substrate as taught by Yang, one of ordinary skill in the art would have been motivated to replace the polymeric substrate in the biomolecular carrier taught by Noetzel with a diamond-like substrate.

Applicants respectfully traverse.

As noted above, in order to establish *a prima facie* case of obviousness, the cited references must provide some motivation to combine reference teachings and the motivation must be based on a reasonable expectation of success. Based on the teachings of Noetzel and Yang, one of skill in the art would not reasonably expect that replacing the polymeric materials used in the methods of Noetzel with a diamond-like carbon film, a carbon nanotube or a carbon nanoparticle would successfully provide a substrate for a biomolecular carrier.

Noetzel discloses wet chemical methods for producing substrates for biomolecular carriers using very specific polymeric materials. The disclosure of Noetzel makes it clear that the polymeric materials employed in the methods must have a certain structure. Specifically, the polymeric materials of Noetzel *must* be derived from monomers having an –NH-R-Y group, where Y represents an OH or NH_2 functionality. (See col. 1, lines 48-59.) These OH and NH_2 functionalities are reacted with spacer molecules to introduce reactive groups, such as epoxy groups, capable of reacting with a biologically active substance. (See, col. 2, line 62 through col. 3, line 10.) As one of skill in the art would recognize, the diamond thin films of Yang do not inherently include OH or NH_2 functionalities. As such, these thin films would be incapable of reacting with the spacer molecules of Noetzel, using the methods disclosed by Noetzel, to provide a substrate for a biomolecular carrier. Thus, the modification proposed by the Examiner (i.e., the replacement of the polymeric materials of Noetzel with the diamond thin film of Yang) is not based on a reasonable expectation of success. Therefore, the Examiner has failed to provide a *prima facie* case of obviousness and Applicants respectfully request that this rejection be withdrawn.

Applicants further note that the Examiner may be proposing to substitute the amine-functionalized diamond thin films of Yang for the polymeric materials of Noetzel. Even under this interpretation, however, the Examiner's rejection is insufficient to provide a *prima facie* case of obviousness.

As noted above, in order to establish a *prima facie* case of obviousness, the cited references must provide some suggestion or motivation to combine reference teachings. (MPEP 2142) In evaluating the teachings of the prior art, a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. (MPEP 2141.02 VI) In addition, if the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. (MPEP 2143.01 V)

When considered in their entirety, the teachings of Noetzel lead away from the replacement of the polymeric materials disclosed therein with a diamond-like thin film, a carbon nanotube or a carbon nanoparticle. Moreover, such a substitution would render the invention of Noetzel unsatisfactory for its intended purpose.

In the Office Action, the Examiner characterized Noetzel as teaching "a polymeric substrate as a carrier molecule for biomolecules by binding the surface of the substrate with a spacer." This characterization is incomplete. Noetzel teaches polymeric materials in the form of bead polymers having adequate porosity and swellability *for use as beads in a column separation.* (See col. 1, lines 40-47 and col. 5, lines 57-63.) The polymeric materials of Noetzel are provided as essentially spherical macroporous beads having a mean particle size of 20 to 800 μm and a mean pore diameter of 5 to 2000 nm. (See col. 1, lines 62-65 and col. 5, lines 53-57.) The bead polymers have a swellability in water of up to 30 times their original bulk volume. (See col. 5, lines 63-68.) In contrast, Yang teaches diamond thin films for use in microelectronics devices. (See page 283, right column, first paragraph.) The Examiner has identified no motivation to substitute a diamond thin film, as disclose in Yang, for the macroporous, water-swellable polymer beads, as recited in Noetzel. Indeed, there can be no such motivation because the substitution of a diamond-like film for the macroporous spherical bead polymers would render the carrier materials of Noetzel unsatisfactory for their intended purpose as beads in a column separation process. (See col. 1, lines 35-47 and col. 5, lines 57-63.) For these reasons Applicants respectfully request that this rejection be withdrawn.

III. Rejection of Claims under 35 U.S.C. § 103(a) over Noetzel in View of Dai

Claims 39-50 were rejected under 35 U.S.C. § 103(a) as unpatentable over Noetzel in view of U.S. Patent No. 6,528,020, issued to Dai et al. (hereinafter "Dai"). In support of this rejection, the Examiner stated:

> The Dai teaches the use of carbon nanotube as a preferred class of substrate because of its sensitivity to a wide range of chemical and biological species (Dai, col. 1, lines 50-57). Because of the versatility of carbon nanotube substrate as taught by Dai, one of ordinary skill in the art would have been motivated to replace the polymeric substrate in the biomolecular carrier taught by Noetzel with a carbon-nanotube substrate.

Applicants respectfully traverse.

As noted above, in order to establish a *prima facie* case of obviousness, the cited references must provide some motivation to combine reference teachings and the motivation must be based on a reasonable expectation of success. Based on the teachings of Noetzel and Dai, one of skill in the art would not reasonably expect that replacing the polymeric materials used in the methods of Noetzel with the carbon nanotubes of Dai would successfully provide a substrate for a biomolecular carrier.

Noetzel discloses wet chemical methods from producing substrates for biomolecular carriers using very specific polymeric materials. The disclosure of Noetzel makes it clear that the polymeric materials employed in the methods must have a certain structure. Specifically, the polymeric materials of Noetzel *must* be derived from monomers having an –NH-R-Y group, where Y represents an OH or NH_2 functionality. (See col. 1, lines 48-59.) These OH and NH_2 functionalities are reacted with spacer molecules to introduce reactive groups, such as epoxy groups, capable of reacting with a biologically active substance. (See, col. 2, line 62 through col. 3, line 10.) Dai does not describe a carbon nanotube having OH or NH_2 functionalities. As such, the carbon nanotubes described in Dai would be incapable of reacting with the spacer molecules of Noetzel, using the methods disclosed by Noetzel, to provide a substrate for a biomolecular carrier. Thus, the modification proposed by the Examiner (i.e., the replacement of the polymeric

materials of Noetzel with the carbon nanotubes of Dai) is not based on a reasonable expectation of success. Therefore, the Examiner has failed to provide a *prima facie* case of obviousness and Applicants respectfully request that this rejection be withdrawn.

Applicants also reiterate that in evaluating the teachings of the prior art, a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. (MPEP 2141.02 VI) In addition, if the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. (MPEP 2143.01 V)

When considered in its entirety, the teachings of Noetzel lead away from the replacement of the polymeric materials disclosed therein with a carbon nanotube. Moreover, such a substitution would render the invention of Noetzel unsatisfactory for its intended purpose.

As discussed above, Noetzel teaches polymeric materials in the form of bead polymers having adequate porosity and swellability *for use as beads in a column separation.* (See col. 1, lines 40-47 and col. 5, lines 57-63.) The polymeric materials of Noetzel are provided as essentially spherical macroporous beads having a mean particle size of 20 to 800 μm and a mean pore diameter of 5 to 2000 nm. (See col. 1, lines 62-65 and col. 5, lines 53-57.) The bead polymers have a swellability in water of up to 30 times their original bulk volume. (See col. 5, lines 63-68.) In contrast, Dai teaches carbon nanotubes for incorporation into sensors and electronic and mechanical devices. (See col. 1, lines 50-61 and col. 4, lines 23-24.) The Examiner has identified no motivation to substitute a carbon nanotube, as disclose in Dai, for the macroporous, water-swellable polymer beads, as recited in Noetzel. Indeed, there can be no such motivation because the substitution of carbon nanotubes for the macroporous spherical bead polymers would render the carrier materials of Noetzel unsatisfactory for their intended purpose as beads in a column separation process. (See col. 1, lines 35-47 and col. 5, lines 57-63.) For these additional reasons Applicants respectfully request that this rejection be withdrawn.

In view of the foregoing remarks, Applicants respectfully submit that all of the claims remaining in the application are in condition for allowance and favorable action thereon is respectfully solicited.

Respectfully submitted,

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By _____

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